FY 2012 APHIS Form 7023 COLUMN (E) EXPLANATION

1. ***Registration Number:*** 93-R-0435/9194

2. ***Species:*** Bats

3. ***Number of Animals:*** 6

4. ***Explain the procedure producing pain and/or distress:***

The aim of this work is to study audio-vocal feedback control, that is, how hearing affects vocalizations in the mammalian brain. An understanding of audio-vocal feedback control has practical and significant implications in human speech disorders, particularly, stuttering and dyslexia, and may ultimately lead to effective medical treatments for these conditions.

After fully anesthetizing the bat with isoflurane and administering a preemptive dose of the anti-inflammatory pain killer carprofen, sterile technique is used to affix a small metal needle (canula) to the surface of the skull with sterile dental cement, identical to that which is used for hip replacement procedures in humans. The fixed position of the canula allows for painless and reproducible access to specific areas of the brain for the injection of tiny volumes of selected drugs (equivalent to less than one millionth of a teaspoon) and for the painless introduction of a thin electrode for recording brain activity.

The only potentially distressful *(not painful)* phase of these studies is the physical restraint of the awake bats contained in a soft-foam body holder for recording of vocalizations and drug administration through the canula. Although the awake restraint of the bats typically lasts no more than 60-90 minutes, we requested IACUC approval for up to 5 hrs in the event that abnormally longer recording periods are needed.

5. ***Provide scientific justification why pain and/or distress could not be relieved. State methods or means used to determine that pain and/or distress relief would interfere with test results:***

The neurobiological experiments (recordings and drug injections) cannot be performed under general anesthesia, as this would preclude the bat from vocalizing on its own. To mitigate any possible discomfort at the incision site during the recordings, local anesthesia (bupivacaine) is applied to the surgical margins approximately every 30 min. Although general analgesia (a pain killer) is used before and after the surgery itself, these drugs cannot be administered during the recording phase because they would affect physiologic brain processes and unduly influence experimental results in unpredictable ways.

During the experimental sessions, the absence of struggling and/or excessive vocalizations, such as squeaking and other calls usually uttered under distress confirms that there is no undue pain, distress or injury to the bat. In fact, the bats regularly fall asleep during the recording sessions and we have to apply gentle air puffs onto their wings to wake them up and get them to continue vocalizing. After each session the bats behavior is completely normal, i.e., they fly, eat, drink as usual and do not show any signs of distress.